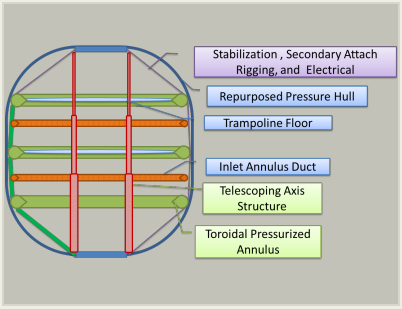
Expandable Habitat Outfit Structures, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

Topic H3.01 captures the need for robust, multipurpose deployable structures with high packing efficiencies for next generation orbital habitats. Multiple launch and payload providers have expressed interest in repurposing pressure vessels as on-orbit habitats and require outfitting for secondary structure, floors and dividers, ECLS ducting, thermal control accommodation, radiation shielding, wiring, lighting etc. to make the volume functional. The proposed innovation uses multi-functional, intelligent fabrics in a tensioned membrane architecture that can be deployed by means of (a) pressurized annulus envelope that when inflated, expands against the habitat hull to anchor the structure while (b) multipurpose telescoping tubes at the core of the habitat expand in the axial direction across the opposing bulkheads to index the annulus pressure vessels. Tensioned membrane structures exhibit the highest specific stiffness of any known structure and can produce significant weight savings over hybrid structural designs. Inflatable structures package well and can significantly reduce stowed volume requirements and dampen launch vibro-acoustics. An inflatable habitat structure can most effectively address packaging, deployment, damage tolerance, ease of repair and in-flight maintenance. With lightweight rigging, these secondary structures will be designed to be fully repositionable, creating a modular approach to habitat outfitting. The Paragon/TRLA team will develop a design that packages efficiently, deploys repeatability, and provides valuable capabilities including a.) minimum mass, design simplicity, minimal parts count, b.) a structure which folds efficiently deployment repeatability c.) secondary soft goods fabricated which are integrated during build-up yielding minimal ground handling loads, and d.) flooring, walls, ECLS air flow ducts, TCS fluid loops, lighting, electrical/data lines, and radiation protection structures all integrated in unison during buildup.



Expandable Habitat Outfit Structures, Phase I Briefing Chart Image

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destinations	3

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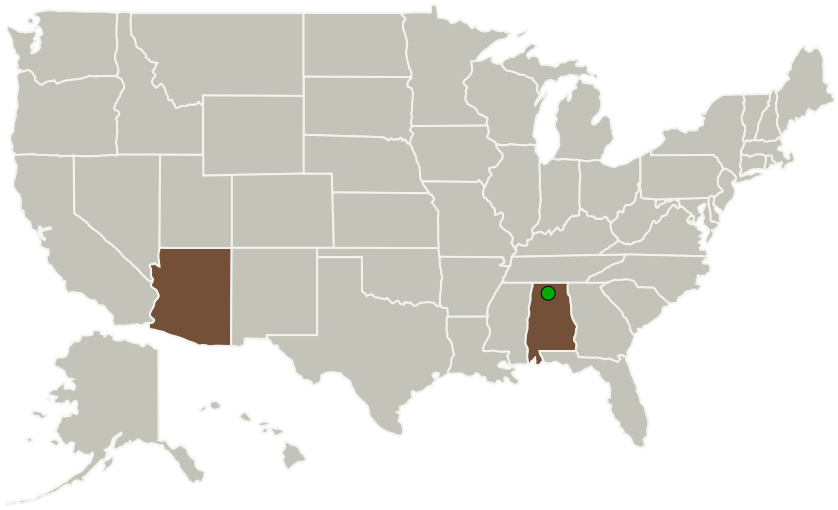
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Paragon Space Development Corporation	Lead Organization	Industry	Tucson, Arizona
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Arizona

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Paragon Space Development Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

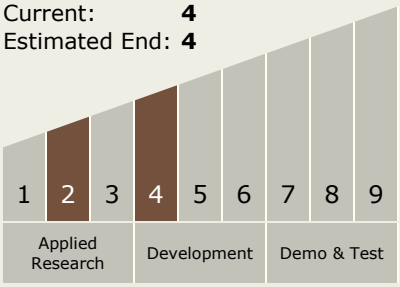
Carlos Torrez

Principal Investigator:

Chad E Bower

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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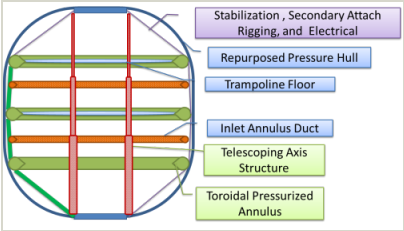
Images



Briefing Chart Image
Expandable Habitat Outfit Structures, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/129584)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.4 Habitation Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System